



Caltrans Division of Research,  
Innovation and System Information

# Research Results

Right of Way  
and  
Land Surveys

**JANUARY 2015**

**Project Title:**

Mobile Terrestrial Laser Scanning  
Workflow Development,  
Technical Support and Evaluation

**Task Number:** 2517

**Start Date:** October 1, 2012

**Completion Date:** June 14, 2014

**Product Category:** New manual, handbook,  
guidelines, or training; improved business  
practice, procedure, or process

**Task Manager:**

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## Mobile Terrestrial Laser Scanning for Surveying

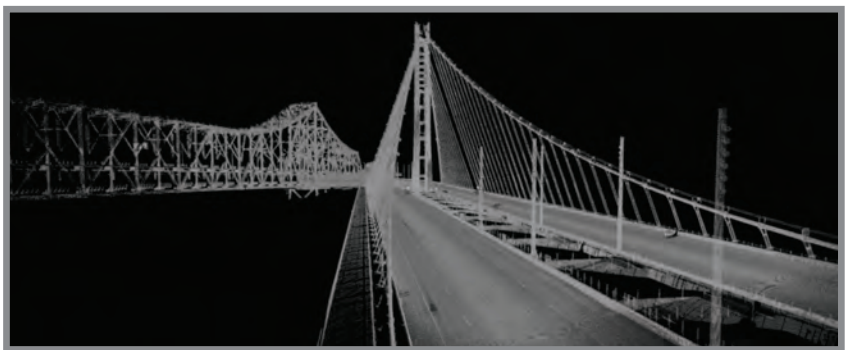
*Mobile surveying equipment facilitates rapid project delivery  
and enhances safety of field personnel*

### WHAT WAS THE NEED?

Caltrans requires survey grade measurements for various projects, such as bridge structures, pavements, major accident investigations, and roadside assets. Typically, when performing a survey, field personnel are exposed to high-speed traffic, often with no barrier or protection. Mobile terrestrial laser scanning (MTLS) is a relatively new technology that enables surveyors to work safely from a vehicle. MTLS also provides many efficiency and technological improvements. The system produces accurate and precise geospatial data at or near highway speeds, enabling surveyors to collect many miles of roadway in a single day, accelerating project delivery. Users can then work with the broad range of data collected while in the office, removing the need to return to the field for measurements. For these reasons, Caltrans purchased an MTLS system in 2012, which has been used for many northern California projects. After this initial pilot, workflow practices and training are needed to properly integrate the technology into current Caltrans projects, as well as a cost-benefit review to determine whether to purchase another MTLS system or use the existing one throughout California.

### WHAT WAS OUR GOAL?

The goal was to develop standards and specifications, best practices, training, and a cost-benefit analysis to effectively integrate MTLS into the Caltrans workflow.



*Point cloud image of the new  
San Francisco-Oakland Bay Bridge*



Caltrans provides a safe, sustainable,  
integrated and efficient transportation  
system to enhance California's  
economy and livability.

## WHAT DID WE DO?

Caltrans, in partnership with the University of California, Davis Advanced Highway Maintenance & Construction Technology Research Center, explored how the MTLS technology could be used in various projects in the field. The researchers documented the case studies and results and identified the level of operation and safety achieved from using MTLS. The researchers also provided recommended best practices and standards on MTLS surveying, developed training materials, and conducted training sessions for surveyors on how to use the MTLS equipment and software.

## WHAT WAS THE OUTCOME?

The Caltrans MTLS vehicle has been used for over 90 projects in eight different Caltrans districts, mostly for producing pavement digital terrain models. The projects included rural and urban multilane divided highways, rural undivided highways, bridges, and tunnels. Northern California districts 1, 2, 3, and 4 were the primary users and performed additional work for Caltrans districts 6, 9, 10, and 11. After user training, the MTLS system will be deployed to central and southern California during the 2015 winter season.



*Photo log image collected with the MTLS scanner system at Altamont Pass on Highway 580*

## WHAT IS THE BENEFIT?

Mobile surveying improves worker safety and decreases the lead time from data requested to data delivery, survey time and cost, the number of return site visits to collect additional data, and travel delay for motorists. MTLS provides high-resolution 3D data that improves visualization and enhances project design, facilitating decision-making. Collecting and processing data safely, efficiently, and accurately saves money while significantly reducing work crews' exposure to direct traffic, minimizing injuries, injury-related costs, and roadway congestion for traveling motorists.

## LEARN MORE

To view the complete report:

<http://ahmct.ucdavis.edu/pdf/UCD-ARR-14-06-14-01.pdf>



*Caltrans Trimble MX8 MTLS vehicle*